Differences in Suicide Between the Old and the Oldest Old

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Objectives. The purpose of our study is to examine suicide trends among the old (65–79 years) and oldest old (80+ years).

Methods. All persons aged 50 or older who committed suicide in Denmark during 1972–1998 are included in the analysis. Suicide trends are analyzed by sex, age, civil status, and methods. Age, period, and cohort effects are examined graphically.

Results. In all, 17,729 persons (10,479 men and 7,250 women) committed suicide. During the study period, the suicide trends among the middle-aged and the old adults decreased. The trend among the oldest old, by contrast, remained stable. Marriage ceases to have a preventive effect among the oldest old. The oldest old tend to use more determined suicide methods.

Discussion. Distinct differences in suicide mortality between the old and the oldest old were found. The suicide trend of the oldest old does not reflect the recent improvements found in their overall mortality. Interestingly, it seems that the preventive effect of marriage seems to be ceasing with increasing age.

The highest risk of suicide is found among the elderly population. Because of the increasing number of elderly persons, particularly of the oldest old (i.e., those aged 80 or older), the number of suicides is expected to increase in the future (Bille-Brahe & Jessen, 1994). However, there are considerable differences between the old and the oldest old. Today, we find a generation of old persons who are relatively fit and a generation of oldest old persons who are more frail (Jeune, 2002). It is therefore to be expected that the suicide trends among the old and the oldest old differ in general as well as over time. In order to conceptualize preventive measures, it is highly important to identify the subgroups within the elderly population who have an elevated risks of committing suicide.

The marked increase in the number of oldest old over recent decades is mainly due to a decline in the mortality of that age group (Jeune & Skytthe, 2001; Kannisto, 1996; Vaupel & Jeune, 1995; Vaupel et al., 1998; Wilmoth & Horieuchi, 1999). The decline is likely to be the result of improvements in living standards, lifestyle, medical treatment, and caretaking of the elderly persons (Jeune, 2002). Although better functional abilities have been documented among the elderly population, including the oldest old (Manton & Gu, 2001; Myers, Torrey, & Kinsella, 1995), the latter are much more frail and dependent on care than younger elderly adults.

Elderly persons aged 65 tend to have the highest suicide rate of all older age groups (Bille-Brahe & Andersen, 2001; De Leo, Carollo, Dello Buono, Conforti, & Mastinu, 1995; De Leo, Conforti, & Carollo, 1997; Dennis & Lindesay, 1996; McIntosh, 1992). Studies report a higher suicide risk among very old men, whereas the same has not been found consistently for women (Coren & Hewitt, 1999; De Leo, 1988, 1999; De Leo & Ormskerk, 1991; Kristensen & Nielsen, 1996; Manton, Blazer, & Woodbury, 1987; Quan & Arboleda-Florez, 1999). In addition, it has been shown that marriage has a preventive effect on suicide risk among elderly people (Cantor, 2000; Moscicki, 1996).

According to the theory of social roles (Cottrell, 1942), changes in such roles require adjustment and might affect the self-esteem of the individuals concerned. Becoming an elderly person is often characterized by a number of events that lead to a loss of social roles. Although there is a gain in some roles, like that of becoming a grandparent, most role changes are unwanted or are related to a negative impact (Holmes & Rahe, 1967; Hooyman & Kiyak, 1995). Examples of such changes are the entry into widowhood, retirement, and a declining physical health. Especially for men, retirement might be quite problematic because much of their social definition is based on their role as a worker and provider for the family (Miller, 1979; Powell, 1970).

The experience of a loss might not necessarily have any long-term effects on self-esteem. However, when several significant and negative events are experienced within a limited time span, it is likely that this will have a negative impact on the individual concerned (Blau, 1959; Holmes & Masuda, 1974). Various studies show that experiencing a number of cumulative losses within a short period of time might lead to an increased susceptibility for physical illness, depression, or even suicide (Miller, 1979; National Institute of Health, 1991). Miller (1979) identified eight types of losses that are associated with an increased propensity for suicide among elderly people: physical illness, mental illness, institutionalization, loss of partner, retirement, disappointments in friendships or relationships with children, alcoholism, or any combinations of these losses.

S314
With increasing age, losses are occurring more frequently. This implies that there is less time to recover from a previous loss before a person experience yet another loss. Concerning the oldest old, we formulate the hypothesis that this age group, who in general has experienced more losses than other age groups, will have a higher suicide risk than the younger age categories. Taking the general mortality decline and the improvements in the quality of life that were described into account, we find it plausible that these developments would also have a modifying impact on the effect of the intensification of losses. At least among the younger groups of elderly persons, we expect these developments to be reflected in their suicide mortality. It is less clear if the recent improvements will reduce the suicide mortality of the oldest old adults.

Marriage most probably has a preventive effect on suicide in most age groups. However, considering the concentration of other types of losses found among the oldest old, we think that marriage might bring a lower level of consolation at these higher ages. We hypothesize that marriage will be a less protective factor among the oldest old, particularly among the oldest old men.

A detailed analysis of the differences in suicide trends between the old and the oldest old over time that examines civil status and suicide methods has yet to be carried out. More information on the risk patterns of elderly people, and in particular the oldest old, is needed in order to define the risk groups within this population group who are particularly susceptible to suicide. The purpose of this paper is to analyze suicide trends among the old (65–79 years) and the oldest old (80 years or older) in recent decades. Special attention is paid to differences in the trends between these two groups; sex, age, civil status, and suicide method are looked at. Age, period, and cohort effects are examined graphically.

**Methods**

Individual-level data on all suicides occurring in Denmark (less Greenland and the Faroe Islands) for the period 1972–1998 was obtained from the Register of Suicide kept at the Center for Suicide Research in Odense, Denmark. Data on population size by age and civil status for each calendar year were acquired from Statistics Denmark (Statistic Denmark, 2000). For reasons of comparison, all persons aged 50 or older are included in the study.

The suicide rate between ages \(a\) to \(a + n\) per 100,000 denoted by \(nM_a(t)\) for each calendar year is

\[
\frac{\text{Number of suicides in the age range } a \text{ to } a + n \text{ during time } t}{\text{Number of person-years lived in the age range } a \text{ to } a + n \text{ during time } t}
\]

and it was calculated as

\[
nM_a(t) = \frac{nD_a(t)}{nN_a(t) \exp(\ln([nN_a(t+1)]/[nN_a(t)]))/2}
\]

The number of suicides in the age range \(a\) to \(a + n\) occurring within year \(t\) is denoted by \(nD_a(t)\), whereas \(N_a(t)\) represents the number of persons in age group \(a\) to \(a + n\) on the first of January of year \(t\) and \(N_a(t+1)\) the same group on the first of January of year \(t + 1\). The number of suicides is divided by the midyear population, which is used as an estimate of the person-years lived. The midyear population is calculated by using the exponential growth rate (Preston, Heuveline, & Guillot, 2001). Suicide rates were calculated for the middle-aged (50–64 years), old, and the oldest old adults.

By using a Lexis map, we examined age, period, and cohort effects (APC effects) graphically. The Lexis contour map is based on age- and year-specific suicide rates plotted into a diagram (Vaupel, Andreev, Wang, & Yashin, 1994). Each square denotes the suicide rate for one particular age and one particular calendar year. The APC effects can be identified when the levels of the suicide rate are compared along a horizontal, vertical, or diagonal axis, as illustrated in Figure 1. This way, an age effect is denoted as a horizontal shift in the suicide rates. Likewise, period and cohort effects would be found as changes along the vertical and diagonal lines, respectively. For our purposes, cohort effect would follow a diagonal line of approximate 60°, because each square denoted 1 year in terms of age and 2 years in terms of calendar years. By applying this method, we avoid the general problem that the APC effects implicate each other (\(A = C + P\)); see for instance, Snowdon and Hunt (2002).

**Results**

During the period 1972–1998, a total of 17,729 persons aged 50 or older committed suicide in Denmark. Of these, 10,479 were men and 7,250 were women. The annual suicide rates for men in the age groups 50–64, 65–79, and 80 years or older are shown in Figure 2. Since the beginning of the 1980s, there has been a remarkable decline in suicide rates for the two younger age groups. At present, these have a rate of approximately 30 suicides per 100,000. The suicide rate of the oldest old has remained at a fairly constant level of approximately 65 per 100,000 during the previous two decades. During the entire period, the highest suicide rate was found among the oldest old.
Figure 2. Age-specific suicide rates per 100,000 by sex: 1972–1998.
men. For women, we also observe a decreasing trend of suicide rates among the two younger age groups: From a level between 30 and 40 per 100,000, the suicide rate has now decreased to approximately 15 per 100,000. During the period 1994–1998, the suicide rate among the oldest old women increased to a higher level than that among younger age groups. A decreasing trend in suicide frequency among the oldest old is found over recent years.

In the Lexis map for men (Figure 3), an age effect for the oldest old (aged 80 or older) is found. There were no clear period or cohort effects for men; for women, neither age, period, nor cohort effects were observed (Figure 4).

Men aged 50–64 and 65–79 commit suicide approximately twice as often as women, whereas the sex ratio among the oldest old is approximately 1:3 (Figure 5). The suicide rate is analyzed by civil status and age groups for the years 1994–1998 (Figure 6). In general, never married, divorced, and widowed men and women have higher suicide rates. However, we find an increased suicide rate for oldest old persons who are married for both sexes.

The distribution of the suicide methods in percent is shown in Figure 7 for 1994–1998. Among men, the most frequent suicide method was hanging, followed by self-poisoning, firearms, monoxide, and gas. The most frequently used method among women was self-poisoning. Approximately 35% of the middle-aged men who committed suicide did so by hanging. In the age groups of 65–79 years and 80 years or older, 42% and 52%, respectively, committed suicide by hanging. This method accounted for 27% of the suicides among middle-aged women and for approximately 34% and 37%, respectively, among old and the oldest old women.

When examining the time trends for the entire period 1972–1998 (figure not shown), we found that there has been a decreasing tendency for men to commit suicide by self-poisoning during more recent years, whereas the use of firearms has increased. Self-poisoning also declined among women, whereas hanging and jumping were applied more frequently.

**DISCUSSION**

Two interesting findings occurred in our analysis. First, the suicide rate of the oldest old did not seem to be affected by recent changes in mortality. Second, oldest old persons who were married had a higher suicide rate than that found among younger age groups. We discuss these findings in more detail here.

Although the suicide rates of middle-aged and old adults
Figure 4. Lexis map of the suicide rate per 100,000 for women: 1972–1998.

Figure 5. Sex ratio: 1972–1998.
decreased during the past decades, this is not the case for the oldest old adults. Furthermore, the suicide rate of the latter age group has a markedly higher level than that of the middle-aged group and the old group, who both are at approximately the same level. We do not find any clear cohort effects in the Lexis maps that can explain the differences in suicide mortality among the old and the oldest old. In the context of our hypothesis, this seems plausible; the oldest old are more frail and would have experienced more losses than younger age groups. There might therefore be a higher inclination to commit suicide among the oldest old adults than among old and middle-aged adults. However, taking recent improvements in the general mortality among the oldest old into consideration, we would have expected to find this reflected in the suicide trends of this age group, which is not the case. There has not been a decrease in the suicide mortality of the oldest old over recent decades. Factors that contributed to a prolonged life expectancy, such as better living standards, better caretaking, and healthier lifestyles, did not seem to increase the life quality of the oldest old adults sufficiently in order for it to have an effect on their suicide rate.

Married persons were generally found to have a relatively low suicide rate. However, this is not the case for the oldest old group. The suicide rate of married men and women aged 80 or older is markedly higher than that for younger age groups. It is even above the average suicide rate for the studied population. For married women, we find that the suicide rate of the oldest old is higher than for women who have never married, and it is

![Suicide rate per 100,000 by sex, according to civil status and age group: 1994–1998. The horizontal line marks the average suicide rate for all persons aged 50 or older (men, 39.7 per 100,000; women, 18.5 per 100,000).](image-url)
almost at the same level as that for widowed women. It seems that the preventive effect of marriage ceases to have an influence on the suicide risks of the oldest old. This is a new and very interesting finding. According to our hypothesis, the higher number of losses—also in terms of frailty—among the oldest old group compared with younger age groups would mean that this group is exposed to a higher risk of committing suicide. Being married might, under such circumstances, not bring the same consolation as for younger elderly persons. We also find an increasing suicide rate for oldest old persons in other groups of civil status.

It is a striking finding that one out of three women aged 80 or older who committed suicide do so by hanging. For men, too, we found that an increasing proportion of oldest old men commits suicide by hanging. Interestingly, we do not find that firearms are used as frequently as in the United States (Adamek & Kaplan, 1996; Kaplan, Adamek, & Johnson, 1994). This is likely to be due to relatively strict legislation on possessions of firearms in Denmark. Retterstøl (1993) suggested that we make a distinction between determined and indetermined suicide methods on the basis of the lethality of the applied method, that is, if the method allows for rescue or intervention. This distinction gives us an indication of suicidal intent. Suicides committed by hanging, firearms, jumping, and moving objects are considered as determined methods, whereas self-poisoning, drowning, monoxide, and cutting are considered as indetermined methods. Following on from his distinction, we find a clear tendency: With increasing age, more people tend to use
determined methods. For men (women), determined methods are used in 59% (38%) of all suicides among the middle aged; the proportion increases to 64% (42%) and 72% (53%), respectively, for the old and the oldest old. This indicates that the suicide intention is higher among the oldest old than in the younger age groups.

When suicide frequency is examined, it is of course of immense importance that the statistics are valid and reliable (Erlangsen, 1997). Generally, Danish suicide statistics are viewed to be reliable. Our findings show that the proportion of suicides by self-poisoning is declining with increasing age. One might suppose that this is due to the difficulty in determining whether an overdose among the oldest old was intentional or not. In case of the latter, the cause of death would then be registered as a cause of death other than suicide. Kolmos and Bach (1987) examined the registration of suicides in Scandinavia by adding the rates of indetermined and accidental poisonings to the rate of suicidal poisonings. Still, they found a declining tendency of the rate with increasing age. The declining proportion of poisonings with increasing age does not, therefore, seem to be an artifact.

A particular strength of the present analysis is that it is carried out with individual-level data on all suicides, registered over a long period. Suicide trends can therefore be followed year by year, and for particular age groups, which makes the findings more reliable. Furthermore, using Danish data has the advantage of exact numbers. In Denmark, each person has a personal identity number, which is used for population statistics. This means that yearly updates of statistics are based on the actual numbers and not on estimates for intercensus years.

Our findings show that recent improvements in the general mortality of the oldest old over recent decades did not affect suicide mortality. The higher suicide rate among married persons aged 80 or older supports this. It is possible that severe physical illness or other factors have a larger effect on the suicide risk of the oldest old age group than on that of younger age groups. A future research project will examine the effects of physical illness and admission to general hospitals on the suicide risks of these age groups.

Conclusions

We find distinct differences between the suicide mortality of old adults and the oldest old adults. Although the suicide rate among the old has been decreasing for both men and women over recent decades, the same tendency has not been found for the oldest old. The suicide rate of the oldest old has remained at a very high level. This means that improvements in medical treatment, care facilities, and living standards of the elderly population in recent decades do not seem to have had a sufficient impact on general quality of life for the oldest old to reduce their suicide rate. Marriage has less of a preventive effect on the suicide risk of the oldest old age group than it has for younger age groups. Furthermore, the oldest old tend to use more determined suicide methods than the old.

The two most significant and new findings from this study are that, first, the suicide patterns of the oldest old are not following the same trends as those for younger age groups. Second, marriage does not have the same protective effect on the suicide risk of the oldest old population as it has on the younger elderly population.

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